CONTAINER LID HAVING GASKETLESS LIQUID SEAL

This invention relates to containers and associated lids, and more particularly to providing a liquid-tight seal between such lids and containers without the need for separate gasket elements.

Related Applications

Pursuant to 35 U.S.C § 120 and any other applicable provisions, this application hereby claims priority to U.S. Patent Application Serial Number 09/834,528, filed on April 12, 2001. The contents of U.S. Patent Application Serial Number 09/834,528, and of any other U.S. patent or other reference, if any, cited in this application, are hereby incorporated herein by reference.

Background of the Invention:

In order to effectively process, transport, and handle various liquids, it is helpful and frequently necessary to provide a liquid-tight seal between a lid and its associated container. This is commonly accomplished by positioning a flexible gasket along the contact area between the lid and container.

Using a separate gasket member requires additional costs, inventory, assembly, and other factors impacting the economics and ecological considerations of providing a liquid-tight container.

Objects and Advantages of the Invention:

Accordingly, it is an object of this invention to provide an improved lid and container combination.

It is another object of this invention to provide a liquid-tight seal between a container having an upper edge defining an opening, and an injection-molded lid configured to cover the opening. The lid is characterized by a channel at its periphery, with the channel configured to abut and form a liquid-tight seal with the upper edge of the container when the lid is assembled on the container.

A further object of this invention is to provide a container and lid combination of the aforementioned character, in which the container upper edge is tapered from a relatively thinner dimension to a relatively thicker dimension moving in from the upper edge toward a bottom portion of the container, and the channel includes a corresponding tapered section. The tapering relationship provides contacting and sealing engagement between the lid and the container on both an inner contact surface and an outer contact surface of the upper edge. The channel can also sealingly contact the "point" of the container upper edge (or a similar transition surface between the inner contact surface and the outer contact surface). The channel on the lid may be formed by an inner skirt and an outer skirt, both of which are generally downwardly directed, and the outer skirt can includes a lower portion spaced outwardly from the container upper edge to make it easier to align the lid on the container. Cooperating engagement detents on the lid and the container can help hold the lid and the container in the liquid-tight sealing relationship.

An additional object of this invention is to provide a container and lid combination of the aforementioned character, in which corresponding tongue and groove members on the lid and the container interfit with each other within the channel, the tongue and groove members providing the structure to abut and form a liquid-tight seal with the upper edge of the container. In certain embodiments, the container upper edge includes a generally horizontal peripheral surface when the container opening faces upwards, the lid channel including a confronting generally horizontal surface, and the tongue and groove members include a tongue element formed on the lid channel's generally horizontal surface sized and configured to seat within a groove element in the container upper edge.

A related object of this invention is to provide a container lid having a tapered channel at its periphery, the channel configured to abut and form a liquid-tight seal with an upper edge of a corresponding container when the lid is assembled on the container. As indicated above, the tapering provides contacting and sealing engagement between the lid and the container.

A similar object of this invention is the provision of a lid having a generally U-shaped cross section, both legs of the cross section configured to abut a corresponding container to thereby form a liquid-tight seal with the container. The lid can include inwardly directed engagement detents on the outermost of the legs to engage corresponding detents on the container, to hold the lid in the liquid-tight sealing relationship on the container.

Other objects and advantages of the invention will be apparent from the following specification and the accompanying drawings, which are for the purpose of illustration only.

Brief Description of the Drawings:

FIG. 1 is an isometric view of a preferred embodiment of the container lid of the invention assembled with a container.

FIG. 2 is a partial cross-sectional view along reference line 2-2 of FIG. 1.

FIG. 3 is similar to FIG. 2, but illustrates the preferred action to engage the lid with the container.

FIG. 4 is a partial cross-sectional view along reference line 4-4 of FIG. 1.

FIG. 5 is a partial cross-sectional view along reference line 5-5 of FIG. 1.

FIG. 6 is a partial cross-sectional view similar to FIG. 3, but illustrates one of the many alternative embodiments of the invention.

FIG. 7 is a partial cross-sectional view similar to FIG. 2, but illustrates the alternative embodiment of FIG. 6.

FIG. 8 is a partial cross-sectional view similar to FIG. 6, but illustrates another of the many alternative embodiments of the invention.

FIG. 9 is a partial cross-sectional view similar to FIG. 7, but illustrates the alternative embodiment of FIG. 8.

Description of Preferred Embodiment:

FIGS. 1-5 illustrate a preferred hinged, rectangular, recessed lid embodiment of the invention. Persons of ordinary skill in the art will understand, however, that the invention can be practiced in a wide variety of shapes and sizes of containers and corresponding lids, including without limitation round, square, rectangular, hinged lids, non-hinged lids, etc.

In FIGS. 1-5, a container 10 and lid 30 cooperatively engage to provide a liquid-tight seal. Although not critical to the invention (as further explained below), the lid 30 is illustrated as including a hinge member 31. After removal of a tearstrip 33, a first portion 32 of the lid remains relatively fixed to the container 10, while the hinge 31 permits a second portion 34 can be raised away from the container (to permit access to the contents thereof) and lowered back into resealing engagement with the container.

Persons of ordinary skill in the art also will understand that the invention is useful for containers and lids regardless of whether they incorporate tearstrips (for tamper-evidencing or other purposes), and regardless of the tearline pattern for any such tearstrips. Certain basic concepts regarding tearstrips, their patterns, and related matters are disclosed in my U.S. Pat. No. 5,617,968, and the teachings of that patent are expressly incorporated by reference herein. Among other things, for embodiments in which the tearstrip pattern leaves resealing structures on the lid after removal of the tearstrip, those resealing structures (such as the cooperating detents described herein) can continue to

help maintain the liquid-tight sealing relationship between the lid and container, even after removal of the tearstrip and the opening and reclosure of the lid onto the container.

The preferred embodiment of the lid 30 and container 10 are fabricated by injection molding or some similar process, preferably to provide a suitably strong, lightweight, liquid-tight container assembly. Persons of ordinary skill in the art will understand that any suitable process and materials can be used, so long as it provides the liquid-tight sealing described herein.

FIGS. 2-5 illustrate various aspects of the preferred liquid-tight sealing relationship between lid 30 and container 10. Container 10 preferably includes a generally tapered upper edge 12 that defines an upwardly directed opening. Lid 30 preferably covers that opening, and includes a mating peripheral channel 40. Preferred channel 40 is configured to abut and form a liquid-tight seal with the upper edge 12 of the container when the lid 30 is assembled on the container 10. Channel 40 may be conveniently described as having a generally U-shaped cross section, with both inner leg 42 and outer leg 44 of the cross section configured to abut container edge 12 to form the desired liquid-tight seal with the container 10. Preferably, the tolerances and precise angles and dimensions of the upper edge 12 and the channel 40 are such that a liquid-tight seal can be achieved at that interface without using a separate gasket element.

The preferred container upper edge 12 is tapered from a relatively thinner dimension to a relatively thicker dimension moving in from the upper edge 12 toward a bottom portion 11 of the container (FIG. 1). Preferred channel 40 includes a corresponding tapered section. The tapering relationship provides contacting and sealing

engagement between the lid 30 and the container 10 on both an inner contact surface (abutting leg 42) and an outer contact surface (abutting leg 44) of the upper edge 12.

Channel 40 can also sealingly contact the "point" of the container upper edge (or a similar transition surface between the inner contact surface and the outer contact surface). Persons of ordinary skill in the art will understand that, in such embodiments, substantially the entire channel surface (the channel sides and bottom, or the inner sides and bottom of the "U") is in sealing contact with the container's upper edge.

The sealing engagement between channel 40 and upper container edge 12 can be further enhanced by providing the upper edge 12 slightly larger than the channel 40, to ensure an interference fit with the lid and container are assembled together.

The legs 42 and 44 of channel 40 may also be described as an inner skirt 42 and an outer skirt 44, both of which are generally downwardly directed. Outer skirt 44 preferably includes a lower portion 46 spaced outwardly from the container upper edge 12. This spacing is preferably provided by a shoulder section 45, and makes it easier to "seat" or align the lid 30 onto the container 10.

Cooperating engagement detents 48 (on the lid 30) and 50 (on the container 10) can help hold the lid 30 and the container 10 in the liquid-tight sealing relationship, or at least hold them more tightly together. As explained elsewhere herein and in my U.S. Pat. No. 5,617,968, these detents can be used in combination with various tearstrip configurations to provide desired initial sealing and subsequent resealing, as well as other benefits.

Preferably, these detents 48 and 50 are formed as an outwardly extending bead 50 around the periphery of the container and an inwardly projecting bead 48 on the interior of flange 46. Persons of ordinary skill in the art will understand, however, that either or both of the beads 48 and 50 can be interrupted rather than completely encircling the lid or container, or can be positioned at strategic locations about the periphery to provide the desired engagement and retention.

FIG. 3 illustrates, among other things, the preferred motion to engage the lid 30 with the container 10. By pushing in the direction indicated by arrow A, the skirt or flange 46 pivots outwardly and then back inwardly, as the lid "snaps" onto the container as the beads 48 and 50 pass over each other. For applications in which the seal between the lid 30 and container 10 does not need to be as rugged or withstand as much handling or force, the detent engagement described herein may not be necessary.

FIGS. 1 and 4 also illustrates the relationship of inner "walls" such as corner structure 47. Persons of ordinary skill in the art will understand that, in certain applications, it may be necessary or desirable to include various shapes (such as wall 47) within the lid 10, spaced from the channel/seal elements of the lid and container. In such embodiments, the desired liquid-tight seal can best be maintained by providing the inner flange 42 (see FIG. 4) on the lid in abutting contact with the container upper edge 12 around the full perimeter of the container.

FIG. 5 further illustrates aspects of the preferred tearstrip 33 and breakline 27 and hingeline 29. Those breaklines and hingelines are preferably formed in lid 30 to facilitate the hinging of the first portion 32 (see FIG. 1) and second portion 34 (see FIG. 1) at hinge

31. Forming such frangible lines 27 and bendable lines 29 in the lid makes it easier to break loose (as to the vertical line 27) and pivot (along the horizontal line 29) the second portion 34.

FIGS. 6 and 7 illustrate one of the many alternative embodiments of the invention. Most of the general description above applies to this embodiment as well. For example, engagement of the lid and container of this embodiment is illustrated by arrows C and D in FIG. 6, similar to arrows A and B in Fig. 3.

However, the container upper edge in FIGS. 6 and 7 preferably includes a generally horizontal surface 112, and the lid channel preferably includes a confronting generally horizontal surface 114. Corresponding tongue and groove or "tooth and slot" members 116 (on the lid) and 118 (on the container) preferably interfit with each other within the peripheral lid channel. The tongue and groove members 116 and 118 provide the structure (or further structure) to abut and form the desired liquid-tight seal with the upper edge of the container.

Persons of ordinary skill in the art will understand that, among the many alternative embodiments of the invention, the tongue and groove elements 116 and 118 may be reversed from that shown in FIGS. 6 and 7 (so that the tongue is located on the container and the groove is located on the lid). In addition, and as discussed below, the shape, size and alignment of the tongue and groove generally and with respect to each other can vary widely and still provide (and even enhance) many of the benefits of the invention, including the sealing relationship between the lid and container. Among other things, the tongue 116 can be formed slightly larger than the groove 118 to help ensure

sealing contact between the two when the lid and container are assembled with each other.

Similarly, horizontally offsetting the tongue and groove 116 and 118 from each other can provide enhanced or "forced" sealing contact between the tongue and groove. In such an embodiment, during assembly of the lid onto the container, the tip of tongue 116 would initially contact one sloping surface of groove 118 and then "slide" into the bottom of groove 118 (resulting in a "seated" relationship similar to that shown in FIG. 7). Persons of ordinary skill in the art also will understand that this misalignment and consequent beneficial effect can occur even if one or both of the tongue and groove are "symmetrical" and vertical as shown in FIGS. 6 and 7.

Thus, a wide range of "tongue and groove" embodiments of the invention exist other than the vertically symmetrical, aligned embodiment illustrated in FIGS. 6 and 7. By way of further example, FIGS. 8 and 9 are similar to FIGS. 6 and 7, but illustrate yet another of the many alternative embodiments of the invention. Again, most of the foregoing description regarding the embodiment of FIGS. 6 and 7 applies as well to the embodiment of FIGS. 8 and 9. Among other things, engagement of the lid and container of this embodiment is illustrated by arrows E and F in FIG. 8, similar to arrows C and D in Fig. 6.

In the embodiment of FIGS. 8 and 9, however, the tongue or tooth 216 is preferably misaligned with the groove or slot 218. As will be understood by persons of ordinary skill in the art, this intentional misalignment ensures and enhances the contact (and the force of the contact) between tooth 216 and slot 218. Preferably, the lid,

container, tooth, and groove (or at least some of them) are formed of a material having "shape memory" that tends to "force" surface 217 of tooth 216 into an enhanced contact with its confronting surface in slot or groove 218. This "shape memory" is beneficial not only with this "misalignment" feature, but with the slope, relative size, and other tooth/slot features described herein.

Tooth 216 also is preferably sloped, in contrast to the vertically symmetrical V-shape shown in FIGS. 6 and 7. In FIGS. 8 and 9, both sides of tooth 216 are sloped in the same direction (shown as sloping downwardly to the right, or "outward", in FIG. 8). Persons of ordinary skill in the art will understand that sloping downwardly to the left (or "inward") would provide at least some benefits similar to those discussed with respect to the embodiment of FIGS. 8 and 9. Similarly, at least some degree of these benefits can be enjoyed in embodiments where the tooth or tongue 216 has differing slopes (rather than symmetrical, as shown in FIGS. 6 and 7), even if one surface of tooth 216 slopes to the left and the other slopes to the right.

Among other things, and especially if both sides of tooth 216 are sloped the same direction and the material of tooth 216 is sufficiently flexible and has "shape memory" (as discussed above), tooth 216 can bend or deform slightly and seat itself tightly into slot 218 as the lid and container are assembled together.

The sloped, misaligned structure and relationship of tooth and slot 216 and 218 illustrated in FIGS. 8 and 9 (or a downward left – or "inward" – sloping embodiment, not shown) also can provide enhanced sealing in the event of slightly increased internal pressure (or slightly decreased pressure, such as can occur with "burping" gas from the

container) within the "sealed" container. For embodiments such as those of FIGS. 6-9, the desired sealing relationship between the lid and container can occur primarily or exclusively via the aforementioned tongue and groove (or tooth and slot) structures. In certain embodiments (not shown in FIGS. 8 and 9), additional sealing contact can occur between the inner lid skirt 221 and the confronting container sidewall. FIGS. 8 and 9 instead illustrate an embodiment in which one or more burp ribs 223 are provided to help form a burp space 220 between container sidewall 219 and inner lid skirt 221. As mentioned above, such a gap is not necessary (for example, none exists in the embodiment of FIGS. 6 and 7), but it can facilitate certain applications of the invention, such as the ability to "burp" gas or air from the container.

The embodiment of FIGS. 8 and 9 preferably further includes a lead-in angle 222 at the lower outer edge of the lid's inner flange 221, to facilitate seating of the lid onto the container. Lead-in angle 222 does not have to be provided in order to practice the invention, but simply means that the lid and container do not have to be as precisely aligned with each other to smoothly engage each other (as compared to not having such a lead-in angle 222).

In addition, persons of ordinary skill in the art will understand that the various features mentioned above (tongue larger than corresponding groove, misalignment between tongue and groove, sloped tongue, etc.) can be used in various iterations and combinations with each other in various embodiments of the invention.

Although the preferred embodiment of the invention has been described with some specificity, the description and drawings set forth herein are not intended to be

delimiting, and persons of ordinary skill in the art will understand that various modifications may be made to the embodiments discussed herein without departing from the scope of the invention, and all such changes and modifications are intended to be encompassed within the appended claims.